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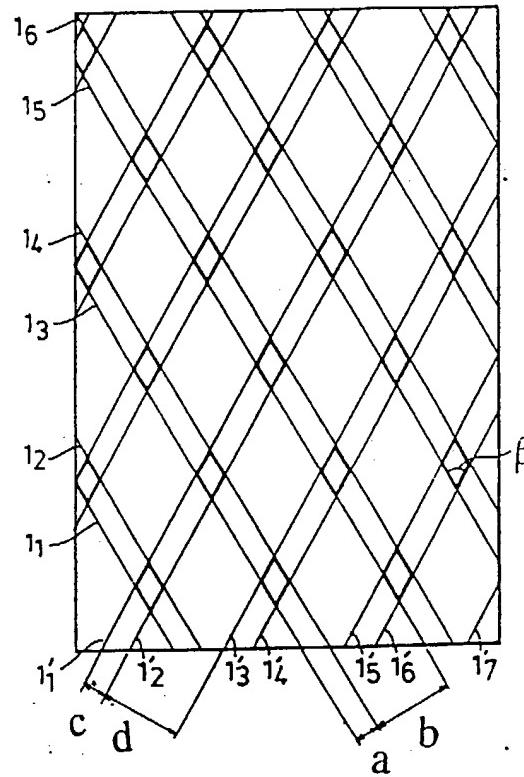
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(54) Title: EMBORESSED WRAPPING PAPER

(57) Abstract

Embossed wrapping paper, preferably sack paper, whose embossing pattern shows a plurality of out of the paper plane raised, delimited identical figures: (A) the figures are straight-lined, from each other separated and over the paper plane evenly distributed and provided with three, four or more sides and planar figure surface which is parallel to, and situated at a distance of 0.05-0.40 mm from the surrounding paper surface and with a total figure area that constitutes <40 % of the total paper area that has been embossed, and by that (B) the connection surface between figure surface and surrounding paper surface, substantially is perpendicular to the paper plane.



\* See back of page

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**Embossed wrapping paper**

It is earlier known to manufacture sacks of embossed material. This has primarily been done to increase the friction between filled sacks which are piled.

5       The embossing patterns, that hitherto have been used on sacks, have meant that the sack material has shown bosses and, possibly, even recesses, relative to the original plane of the material. The thought has been that, by the piling of filled sacks, the bosses will be locked by the parts not embossed (alt. recesses) in the sack lying closest underneath.  
10      A classification of embossing patterns earlier used for sacks, is:

- 15      (i)     raised ridges extending over the width of the paper, forming possibly a checked pattern where only the edges of the chequers are raised. See e.g. US-A-3,904,465 and 3,283,992 and SE-A-12949/65.
- 20      (ii)    out from the paper raised, delimited and, more or less large figure areas. See e.g. FR-A-2,353,207 (76 15678), DE-A-34 37 414, US-A-2,917,223, US-A-3,495,761 and US-A-3,411,698.
- 25      (iii)   JP-A-112635/1986.

Several of these earlier known embossing patterns have in

common, that they show a plurality of, out from the plane of the paper raised, delimited figures, which are identical. It has been found that there is a need for improvements for patterned sack paper, i.a. regarding the friction between 5 sacks which are piled. We have found, that these requirements can be satisfied if the pattern, in addition, shows the following features:

- A. the patterns are straight-lined, from each other separated and over the paper plane evenly distributed and provided with three, four or more sides and planar figure surface which is parallel with and situated at a distance of 0.05-0.40 mm from the surrounding paper surface and having a total figure area constituting <40% of the total paper area and  
10
- B. the connection surface between figure surface and surrounding paper surface is substantially perpendicular to the paper plane.  
15

The pattern, according to the above, will even obtain a friction increasing effect on wrapping paper when goods, 20 that have been wrapped in the paper, are piled one above the other.

With wrapping paper according to the invention is meant a paper, where the main part of the fibre material (e.g. >70%, w/w) usually originates from a long-fibred wood, such 25 as spruce or pine. The fibre material is usually sulphate pulp and may be bleached or unbleached. Recycled fibres may be present in a greater or lesser extent. Several of the kinds of paper that are referred to, e.g. sack paper, may well be clo packed (creped). Normally, fillers are not present in the paper, and if they to some degree do, the amount usually is <10% (w/w), such as <5% (w/w). Among properties 30 that are especially important for sack paper according to the invention, may tensile energy absorption index be mentioned, which, in the longitudinal direction of the paper

ought to be  $\geq 0.4$  kJ/kg, and in its cross direction  $\geq 0.3$  kJ/kg. The elongation in the longitudinal direction usually is  $>1\%$  (in case of wrapping paper of a somewhat better quality  $\geq 2\%$ ) and in the cross direction  $>2.0\%$  (appreciably  $\geq 3.5\%$ ). As upper limits for these four properties, 7 kJ/kg, 6 kJ/kg, 20% respectively 15% are valid. High values of tensile energy absorption index and elongation indicate high-quality products. It can therefore not be excluded, that future development work may lead to, that the upper limits will be exceeded without therefore going beyond what is regarded as sack paper according to the present invention. Values for tensile energy absorption index and elongation shall be determined according to ISO 1924/2-1985(E).

Henceforth, the terminology longitudinal direction = the machine direction of the paper is current, which, in most cases, also is the main direction of the fibres. Cross direction is perpendicular to longitudinal direction.

The figures of the embossing patterns may be straight-lined triangles (triangles), quadrangles, pentagons etc., whereby quadrangles are preferred, and especially of the kind in which there are sides parallel in pairs, like in parallelograms, for example of the kind equilateral. Examples of preferred quadrangles are rhombs including squares, rectangles and rhomboides (= a parallelogram which is neither equilateral or right-angled). Usually, the pattern figures according to the invention show an even-numbered symmetry axis, which, at the most, is four-numbered. In one and the same embossing pattern it is preferred, that all the figures of the pattern are identical, even if, for some patterns, may occur, that an improved friction paper to paper is achieved if 2, 3, 4 or more different kinds of figures exist.

The identical figures are evenly distributed over the patterned surface. The meaning of that is that, if a

straight line is drawn over the surface of the paper and is allowed to intersect a plurality of figures in the same way, the distance between beside each other lying identical figures that are intersected by the line, always shall be the  
5 same. The corresponding distance for other similar lines must not, however, be the same as for the line first mentioned.

The paper according to the invention may, along one or both of its longitudinal sides, have an outer zone lacking  
10 the evenly distributed embossing figures. Alternatively, the figures in these zones may be less distinct because they are not raised as much out of the original paper plane as the more central parts, or because the angle between figure plane and the connection surface to the original paper plane  
15 is greater than 90°. Outer zones of this kind are 1-2 dm, if they exist in the wrapping paper.

Normal pattern frequency usually is below 500, such as below 200 identical figures/dm<sup>2</sup>. As an example, 10-100 may be mentioned, such as 20-60 identical figures/dm<sup>2</sup>. The total pattern area is <40% and usually >0.5% (preferably above 1%) of the total pattern area. It has been shown, that very good improvements in the friction paper to paper may be achieved, if the total figure area is below 30%, such as below 20% or below 10% of the total pattern area.  
25

By improved friction properties is meant, that the improvement is >1%, such as >5%, relative to corresponding unembossed paper (the friction coefficient for paper to paper measured in any direction). The way of measuring is given in the experimental part.

If two identical papers according to the invention are placed with their upper sides against each other, substantially most of the identical figures (>90%) in one of the papers, ought to be placed between corresponding figures in the other paper in that way, that slipping will be made more difficult (the friction will be increased) because the figures in one of the papers will hit the corresponding figures  
30  
35

in the other. The greatest distance between two sides in one and the same figure shall, therefore, in many of the most preferred embodiments, be longer than the shortest distance to the closest lying figure in the same paper. The mentioned longest distance always is a distance corner-to-corner, which in a right-angled triangle always is a side and in a right-angled polygon, always a diagonal.

The orientation of the pattern figures shall preferably be of that kind, that the machine direction of the paper divides an angle in the figures in substantially two ( $+/- 10^\circ$ ) equally large angles. If an acute angle exists in the figures it is preferably such a one that is divided.

In the most preferred embodiment the figures consist of parallelogram. These are shown in figure A and can be defined by the help of a checked pattern, which arises if a first number of parallel, straight lines  $l_1, l_2, l_3 \dots l_n$  are intersected by a second number of parallel, straight lines  $l'_1, l'_2, l'_3 \dots l'_n$  at an angle  $\beta$ . The lines extend over the width of the paper.  $n$  and  $n$  are integers which may be even or uneven and are always greater than 10. The exact number of lines is determined by the distance between them, their slope in relation to the width and the width of the sack paper. The perpendicular distance between the lines in one group are alternating, and is

25	$l_1$ and $l_2 = a$ ,	and between	$l'_1$ and $l'_2 = c$ ,
	$l_2$ and $l_3 = b$ .		$l'_2$ and $l'_3 = d$ .
	$l_3$ and $l_4 = a$ .		$l'_3$ and $l'_4 = c$ .
	$l_4$ and $l_5 = b$		$l'_4$ and $l'_5 = d$ .
	:		:
30	$l_{n-1}$ and $l_n = a$ or b for $n =$ even resp. uneven integer,		$l'_{n-1}$ and $l'_n = c$ . . . or d for $n =$ an even resp. uneven integer

In general it is valid that the distances  $a$ ,  $b$ ,  $c$  and  $d$  < 5 cm, preferably < 3 cm, and that  $a \leq b$ , and  $c \leq d$ . In one important embodiment is  $a = c$  and  $b = d$ , with preference that  $a$  at the same time is <  $b$ . The figures of the pattern 5 are defined as the whole checked pattern minus the area between lines present at the distances  $b$  and  $d$  from each other. The most studied embodiments of the invention, on the priority day of the application, have  $a$ ,  $b$ ,  $c$  and  $d$  always been  $\geq 0.05$  cm, such as  $\geq 0.1$  cm.

10 The angle  $\beta$  fulfills the condition  $10^\circ \leq \beta \leq 170^\circ$ , such as  $10^\circ \leq \beta \leq 90^\circ$  or  $90^\circ \leq \beta \leq 170^\circ$ .

15 It is preferred that the lines  $l_1$ ,  $l_2$ ,  $l_3$  ...  $l_n$  have a positive slope and that the lines  $l'_1$ ,  $l'_2$ ,  $l'_3$  ...  $l'_n$  have a negative slope compared with the machine direction of the paper. The angle  $\beta$  is readily divided in half by the machine direction.

The Figures 1-6 show examples of patterns in question seen from above. The machine direction of the papers is indicated with a double-arrow [ $<\rightarrow>$ ].

20 Figure 1 shows a paper according to the invention where  $a=c \leq b=d$ . The angle  $\beta$  is  $60^\circ$  and the figure frequency is 39 pieces/ $dm^2$ . The symmetry axis is two-numbered. The machine direction divides the angle  $\beta$  in half.

25 Figure 2 shows a paper patterned in a similar manner:  $a=c \leq b=d$ . The angle  $\beta$  is  $30^\circ$  and is divided in half by the machine direction. The figure frequency is 28 pieces/ $dm^2$ . The symmetry axis of the figures is two-numbered.

30 Figure 3 also shows a paper according to the invention, where  $a=c \leq b=d$ . The angle  $\beta$  is  $30^\circ$  and is divided in half by the machine direction. The symmetry axis of the pattern is two-numbered. The figure frequency is 48 pieces/ $dm^2$ .

Figure 4 shows a paper where  $a=c \leq b=d$ . The angle  $\beta$  is  $90^\circ$  and is divided by the machine direction in one angle

which is  $0^\circ$  and one which is  $90^\circ$ . The symmetry axis is four-numbered. The figure frequency is 49 pieces/dm<sup>2</sup>.

Figure 5 shows a paper whose pattern is rather like the one in the preceding figure, but with smaller squares and  
5 greater figure frequency.

Figure 6 shows a paper according to the invention where  $a < c < d < b$ . The angle  $\beta$  is  $90^\circ$  and is divided in half by the machine direction. The symmetry axis of the figures is two-numbered. The figure frequency is 32 pieces/dm<sup>2</sup>.

10 Manufacturing the paper of the invention and apparatus to be used by the manufacturing.

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One aspect of the invention is a method for manufacturing a wrapping paper, preferably sack paper, containing the pattern defined above, by way of embossing a web of sack paper. The paper web as such is manufactured in a way for wrapping paper known per se, and means in the preferred embodiments of the invention a clopacking stage. The embossing is carried out by allowing the paper web, after a possibly clopacking, pass through a roll nip, where one of the rolls  
15 is softer than the other (pressing- respectively embossing roll).

The harder of the rolls (the embossing roll) has an envelope surface which suitably is made of metal (e.g. steel or cast iron) or another hard material. Its envelope surface shows for the wrapping paper of the invention said pattern provided with evenly distributed, raised and identical figures with differences which are due to that the envelope surface not is made of paper. Starting from the earlier mentioned description of the pattern of the paper, thus what  
20 applies is, that "paper" shall be substituted with  
25

30

"envelope" alternatively with "envelope surface" and "the machine direction of the wrapping paper" with "the tangential direction of movement of the envelope surface when the roll is rotating around its axle". As a rule, the raise of the figures shall be somewhat larger than the corresponding raise in the embossed paper. The interval, which usually is suitable for the roll, therefore is 0.06-0.45 mm instead of 0.05-0.40 mm that is applied for the paper. The roll may well be constructed so it can be heated, in order that the paper will dry as fast as possible after the embossing. The paper will partly then more easily lift from the roll and the embossing pattern will partly be freezed more effectively, which, at the same time, makes it more stable. The best, therefore, is if the roll is constructed in a usual way as a drying cylinder in a paper machine, i.e. hollow with an inlet for hot steam (approx. 125-190°C) and outlet for condensate and so-called "spoiler bars" to improve the withdrawal of condensate and to create turbulence in the condensate film which is obtained on the inner walls of the cylinder.

The roll is suitably made from a roll provided with a smooth envelope surface by broaching out recesses corresponding to the surface between lines with the distances b and d between each other (see the above). The depth of the recesses lies in the above mentioned interval.

The pressing roll is made of elastic material which permits that the figures of the embossing roll can be completely impacted in the material when the rolls are pressed against each other. An excellent material is rubber, e.g. hard rubber. The pressing roll is suitably cambered to permit an even line pressure along itself during the embossing.

A suitable embossing pressure ( $\text{kp/cm}^2$ ) depends on factors such as the raise of the figures out of the envelope surface, the hardness of the pressing roll, the thickness of

the paper, choice of fibre material, speed in the head box etc. Suitably, the embossing pressure is 1-10 kp/cm<sup>2</sup>. In order to obtain an effective embossing, which results in a stable pattern, the embossing most suitably should be 5 carried out at a dry solids content of 60-80%, preferably 65-70% (w/w). After the embossing the paper is dried to a dry solids content of above 90% (w/w).

The sack of the invention and the manufacturing thereof

One aspect of the invention is a sack, which surface 10 wholly or partially shows the embossing pattern mentioned above. The sack material may wholly or partially be made of plastic or paper. The pattern consists of a plurality of out of the surface of the sack raised, delimited patterns which are identical. Characterizing features are;

- 15 A. the patterns are straight-lined, from each other separated and evenly distributed over the patterned surface and are provided with three, four or more sides and a planar figure surface which is parallel with, and situated at a distance of 0.05-0.40 mm from the surrounding sack surface and with a total figure area that constitutes <40% of the total paper area and
- 20 B. the connection surface between figure surface and the surrounding sack surface, is substantially perpendicular to the sack surface.
- 25 Otherwise, the same is valid for the sack as for the embossing pattern of the paper with regard to that the embossed surface does not need to be made of paper. In the case that the embossed surface does not have any machine direction, with the machine direction of the paper is meant 30 the height direction of the sack. If only parts of the sack

surface are covered with the embossing pattern, it is suitably on the upper or lower side of the sack, i.e. those sides of the sack that by piling lies against other sacks.

The sack according to the invention is constructed in a manner known for sacks per se, in which the sack material may consist of one to six different layers, so called sheets, in which the outermost sheet, according to the invention, preferably is made of paper. The embossing pattern is situated on the outer layer or, as an alternative, is glued on in the form of embossed sheet of plastic or paper.

By the manufacturing of sacks, one is starting from one or more rolls of web formed sack material, which are just as broad as the circumference of the sack including that part (for example paste joints) which shall be used to form the web material into a longitudinal tube. For each sheet a roll is used, by which that web material which shall be in the outside of the sack (outer web) shall be embossed with any of the patterns given above, or if it is not, it is moistened, embossed and dried in connection to the unwinding. The different webs of material are stored, by the unwinding, continuously one upon the other, whereafter the in that way obtained, possibly multiple sheeted web material, continuously is formed and joined together (pasted together) into a tube. This is later cut into suitable sack lengths, whereafter one of the ends of the respective lengths, is joined together to form the bottom of the sack. Alternatively, the web material is cut to sack length, which therafter is joined together into a tube and is sealed in one end.

The different aspects of the invention are also made clear in the patent claims which are a part of the description.

Experimental part

## 1. Abstract

5 Sack paper, taken from the paper machine at a dry solids content of approx. 65%, has been embossed in a laboratory press under conditions intended, as far as possible, to be equal to embossing in the paper machine.

The static friction paper to paper of the embossed papers, tensile strength, flexure, tensile energy absorption, and air resistance were tested.

10 The friction increases while the tensile energy absorption decreases and the air resistance increases by the embossing of the sack paper. According to the test result, recommended are the patterns D, large squares, B, oblong sparse rhombes, C, oblong dense rhombes and oblong rectangles in now said order.

## 15 2. Putting into practise

## 2.a Embossing

20 Paper in the form of sheets were taken out from the paper machine at a dry solids content of approx. 65% during change of quality. The sheets were stored in plastic bags in order to prevent drying until the embossing had been carried out.

25 The paper sheets were embossed under static conditions in a laboratory press by the help of a steel plate provided with a desired pattern. Patterns that were studied, are evident from the figures 1-6. The embossing was carried out at the pressure  $3 \text{ kp/cm}^2$  during the times 1 s and 5 s.

The sheets were thereafter dried against a drying cylinder between two rigid sheets of blotting-paper, in that way, that they were kept stretched.

2.b Tensile strength, extension, tensile energy absorption  
5 were determined according to ISO 1924/2-1985 (E) and air re-  
sistance according to ISO 3687-1976.

#### 2.c Determination of friction coefficient

This was carried out according to TAPPI T:503, by means of an inclined plane from Buchel van der Korpat, Holland.  
10 The friction, overside against overside, was determined between two strips that had been cut out of the conditioned sheets in their longitudinal respectively their cross direction. The tests were repeated five times for each pattern. The mean value [Mv] of the obtained friction coefficients is  
15 evident from Table 1. By cutting the strips in other directions and/or to match them together in other ways, the friction coefficient may be determined also for other directions in the sack paper.

### 3. Results

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20 The tensile strength is scarcely affected by the embossing while the extension seems to decrease somewhat, which results in a tensile energy absorption decrease of up to 20% in the longitudinal, and up to 16% in the cross direction.

25 The air resistance increases up to 12 units, from 29 to 41 s.

The friction increases up to 0.11 units from 0.63 to 0.74.

Table 1

Fig.	Pattern	Pressing time	Pressing pressure kp/cm <sup>2</sup>	Tensile strength kN/m		Extension %	Tensile energy absorption J/m <sup>2</sup>	Air-resistance long.across sec.	Friction coeffic. long.across sec.
				long.	across				
1		1	3	7.16	3.04	2.78	10.64	127	233
1		5	3	6.51	3.38	2.93	11.20	124	267
2		1	3	6.50	2.95	2.85	9.93	117	214
2		5	3	7.01	3.06	2.87	9.63	126	213
3		1	3	6.62	2.90	2.92	10.14	123	218
3		5	3	6.36	3.03	2.68	11.05	108	242
4		1	3	7.00	3.00	3.19	11.37	137	248
4		5	3	7.06	2.97	2.88	10.43	126	225
5		1	3	6.63	2.88	2.84	10.00	119	215
5		5	3	6.97	3.01	3.05	10.08	133	221
6		1	3	6.59	3.03	2.90	9.87	122	216
6		5	3	6.57	3.22	2.74	11.42	114	256
0		0	0	6.86	3.18	3.24	11.22	139	254
								28.9	0.63

Figure 1 = Rhombs 4 x 6 mm, 39 pieces/dm<sup>2</sup>

Figure 2 = Rhombs 3 x 9 mm, 28 pieces/dm<sup>2</sup>

Figure 3 = Rhombs 3 x 9 mm, 48 pieces/dm<sup>2</sup>

Figure 4 = Squares 5 mm, 49 pieces/dm<sup>2</sup>

Figure 5 = Squares 3,5 mm, 49 pieces/dm<sup>2</sup>

Figure 6 = Rectangle, diagonally, 32 pieces/dm<sup>2</sup>

Figure 0 = Unembossed paper

PATENT CLAIMS

1. Embossed wrapping paper, preferably sack paper, whose embossing pattern shows a plurality of out of the paper plane raised, delimited, identical figures  
5 characterized by, that
    - A. the patterns are straight-lined, from each other separated and over the paper plane evenly distributed and provided with three or more, preferably four sides and planar figure surface, which is parallel to and situated at a distance of 0.05-0.40 mm from the surrounding paper surface and with a total figure area which constitutes <40%, preferably <20%, of the total paper area that has been embossed, and by that  
10
    - B. the connection surface between figure surface and surrounding paper surface substantially is perpendicular to the paper plane.  
15
  2. Embossed wrapping paper according to claim 1, characterized by, that the figures consist of parallelograms defined as chequers in the checked pattern  
20 that is obtained if a number of parallel lines ( $l_1, l_2, l_3, l_4, l_5, \dots, l_n$ ) are intersected by a number of other parallel lines ( $l'_1, l'_2, l'_3, l'_4, l'_5, \dots, l'_n$ ) under an angle  $\beta$ , where  $n$  and  $n$  are integers greater than 10 and where the perpendicular  
25 distance between
- $l_1$  and  $l_2 = a$ . and between  $l'_1$  and  $l'_2 = c$ ,  
 $l_2$  and  $l_3 = b$ .  $l'_2$  and  $l'_3 = d$ ,  
 $l_3$  and  $l_4 = a$ .  $l'_3$  and  $l'_4 = c$ ,  
 $l_4$  and  $l_5 = b$ .  $l'_4$  and  $l'_5 = d$ ,  
:  
30  $l_{n-1}$  and  $l_n = a$  or  $l'_{n-1}$  and  $l'_n = c$   
b for  $n =$  an even resp. or  $d$  for  $n =$  is an even  
uneven integer, resp. an uneven integer,

where the figures in the pattern are defined as the total area over which the lines extend, minus the area between lines at the distance b respectively d from each other, and where a, b, c, d are chosen so, that  $a \leq b$  and  $c \leq d$ .

- 5      3. Embossed wrapping paper according to claim 2,  
characterized by, that  $a = c$  and  $b = d$ , preferably with  $a \leq b$ .
- 10     4. Embossed wrapping paper according to any one of the  
claims 2-3, characterized by, that the lines  
 $l_1, l_2, \dots, l_n$  have a positive slope and the lines  
 $l'_1, l'_2, \dots, l'_n$  have a negative slope against the  
machine direction of the paper, preferably with the same  
absolute value and that the angle is  $10^\circ \leq \beta \leq 170^\circ$ , preferably  
 $10^\circ < \beta < 90^\circ$ .
- 15     5. Embossed wrapping paper according to claim 1,  
characterized by, that a corner-to-corner  
distance, in appropriate cases a diagonal distance, in  
respective figure is longer than the shortest distance to  
the figure lying closest nearby.

Fig. 1

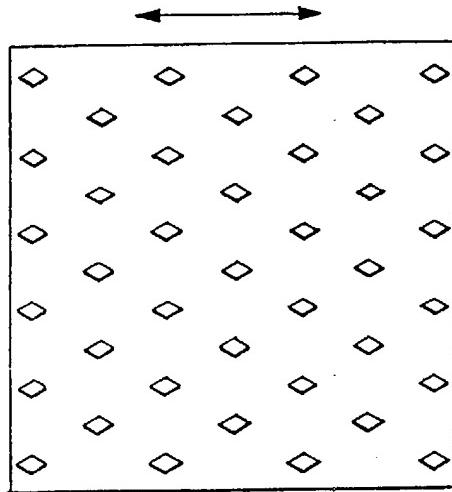


Fig. 2

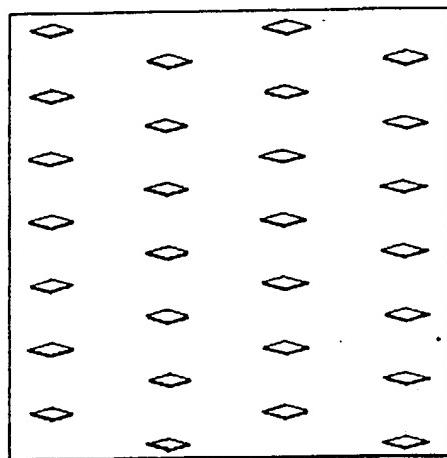


Fig. 3

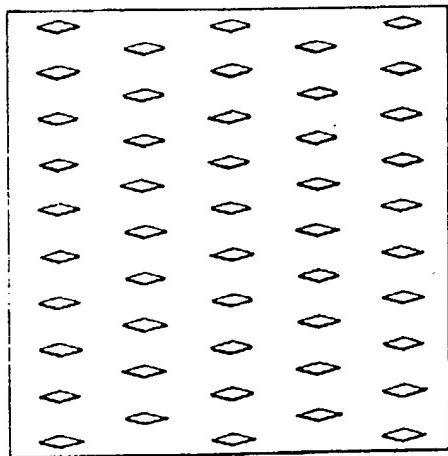
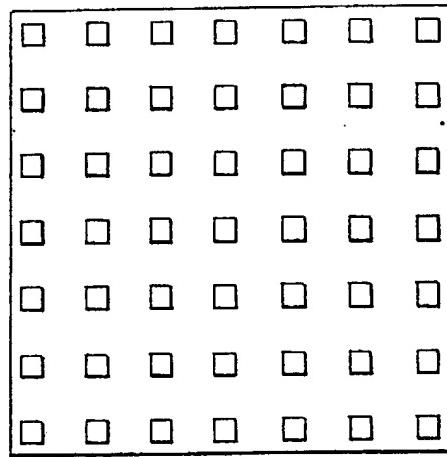


Fig. 4



**SUBSTITUTE SHEET**

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Fig. A

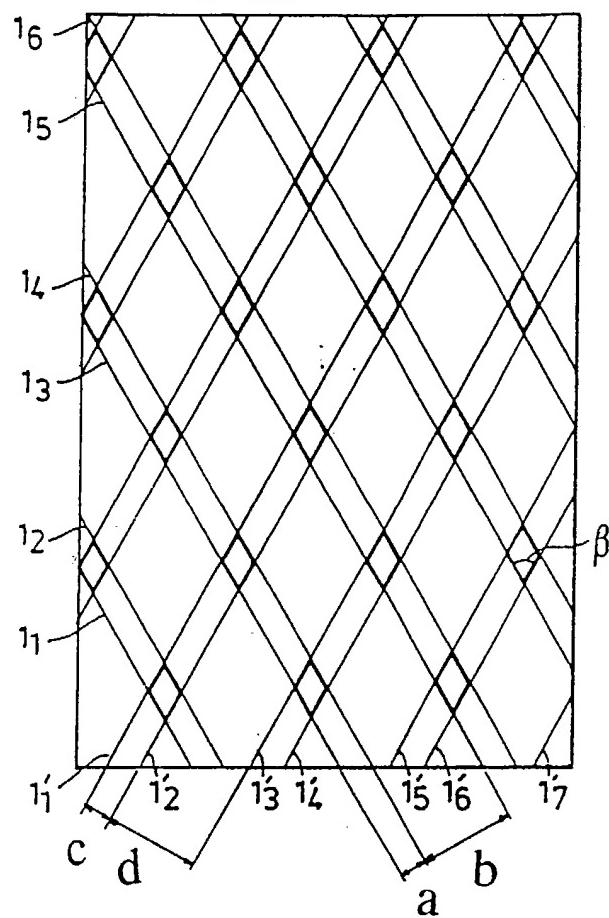
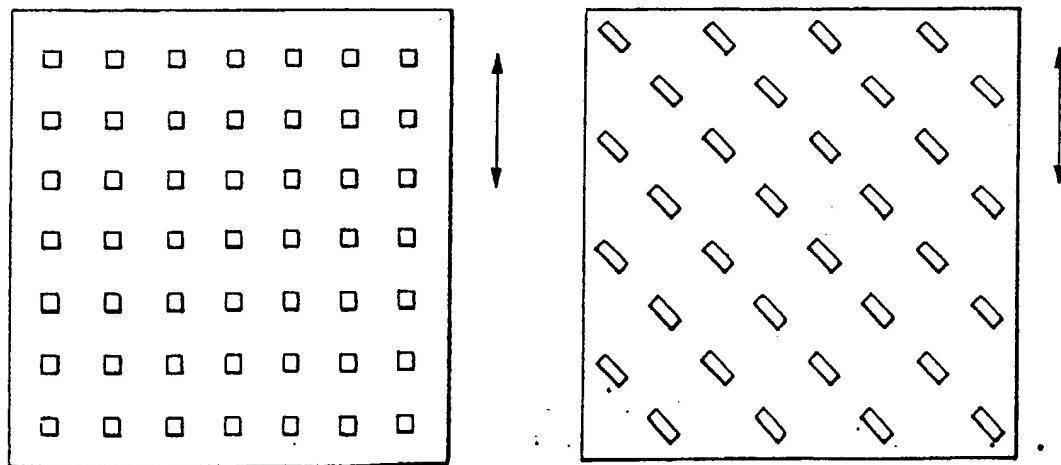


Fig. 5

Fig. 6



SUBSTITUTE SHEET

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00380

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: B 65 D 30/02 // B 65 D 65/38</b>							
<b>II. FIELDS SEARCHED</b>							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Minimum Documentation Searched<sup>7</sup></th> </tr> <tr> <th></th> <th style="text-align: center;">Classification Symbols</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">IPC5</td> <td style="text-align: center;">B 31 F; B 65 D</td> </tr> </tbody> </table>		Classification System	Minimum Documentation Searched <sup>7</sup>		Classification Symbols	IPC5	B 31 F; B 65 D
Classification System	Minimum Documentation Searched <sup>7</sup>						
	Classification Symbols						
IPC5	B 31 F; B 65 D						
<small>Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched<sup>8</sup></small>							
SE,DK,FI,NO classes as above							
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>							
Category	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>					
A	DE, A1, 3437414 (NORDENIA KUNSTSTOFFE PETER MAGER KG) 24 April 1986, see the whole document	1-5					
A	US, A, 2917223 (J.M. LE BOLT ET AL) 15 December 1959, see the whole document	1-5					
A	US, A, 3495761 (L.L. TURAI ET AL) 17 February 1970, see the whole document	1-5					
A	US, A, 3904465 (HAASE ET AL.) 9 September 1975, see the whole document	1-5					
<small>* Special categories of cited documents:<sup>10</sup>            "A" document defining the general state of the art which is not considered to be of particular relevance            "E" earlier document but published on or after the international filing date            "L" document which may throw doubts on priority claim(s) or citation or other special reason (as specified)            "O" document referring to an oral disclosure, use, exhibition or other means            "P" document published prior to the international filing date but later than the priority date claimed              "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention            "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step            "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art            "&amp;" document member of the same patent family         </small>							
<b>IV. CERTIFICATION</b>							
Date of the Actual Completion of the International Search <b>27th August 1990</b>	Date of Mailing of this International Search Report <b>1990 -09- 03</b>						
International Searching Authority <b>SWEDISH PATENT OFFICE</b>	Signature of Authorized Officer <b>Björn Lindkvist</b> <i>[Signature]</i>						

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE.90/00380**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on **90-08-02**  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 3437414	86-04-24	NONE	
US-A- 2917223	59-12-15	NONE	
US-A- 3495761	70-02-17	NONE	
US-A- 3904465	75-09-09	NONE	